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For the Belfast Monthly Magazine.

ON THE USE OF HEATH MOULD IN THE CULTURE OF EXOTIC TREES AND SHRUBS. BY M. THOUIN.

ONE of the most modern discoveries in gardening, and yet the most useful, is the use of heath mould for the sowing and culture of a great number of Exotic plants, particularly the woody vegetables. This discovery is not more remote than twenty years, and there has been occasion for all this time to discover the advantages and the disadvantages, and to confirm these by experiments.

The principal advantage which results from this discovery, is the naturalizing a great number of vegetables, which until that time we despaired of being able to cultivate.

Before this discovery the best informed cultivators regarded as of little value the possession of seeds of a great many curious trees and plants, of which till the present time the individuals who possessed them, made the object of their ambition, from the difficulty which they found in raising, and still more, of preserving them. They brought from England a great number of species which they cultivated for some years without being able to multiply them. Discouraged by the little success of their efforts, they in the end abandoned the culture as useless and expensive.

The first experience of the use of heath-mould was made in the neighbourhood of Versailles; at first it was only employed for compost, for the culture of exotic plants, kept in vases or pots. Some years after, the use of it extended to bulbous rooted plants. Afterwards it was used for the seeds, and in the end the garden borders destined for the culture of the more tender trees and shrubs were formed of it alone.

Experiments in agriculture are not like others, which can be followed at leisure, repeated and varied by the same person who first conceives them, and who does not make them known until the day he can give the result. An experiment in agriculture often requires many years for demonstration, and it is almost always necessity which makes it be undertaken, but as this necessity is felt by many people at the same time, and as the experimenter cannot work without witnesses, an experiment has been hardly begun before those who are interested in its success pursue the same mode of operation.

This was what happened in the use of heath-mould; as soon as the experiment was known, many hastened to repeat it in their gardens; but as they did not all follow the same method, but often proceeded in a different manner, the results were not always the same, thus this discovery was received by some and rejected by others: in the mean time it was easy to see that the discovery would become very interesting. This circumstance joined to the wish of determining the precise method of extending the use of heath-mould, determined us to make experiments on the use of this earth. We have followed these experiments for ten years, and it is the result of them we now lay before the academy. In the commencement of our cultivation we analyzed this earth. Heath-mould* is composed of sand and decayed heath; its colour is black when moist, and ash coloured when dry, soft to the touch, rich and light. It is often found on hills in open places, on soil of a small depth, and commonly enough on

* It is called indifferently heath-mould on sand, the name of mould appears to us the most suitable to it.

white clay or some other matter which retains moisture.* It is seldom that the bed is more than two or three inches deep; in fine, this earth is formed of the decomposed leaves, branches, and roots of heath, mixed with particles of very fine sand in the proportion of about two to three; it is more fit for the culture for which it is intended as it approaches this proportion. It is easy to know it by two means which have equally succeeded with us; the first is to take a quantity of heath-mould that care has been taken to refine, that is to say, that which has had the large stones, the root and stalks not yet reduced to mould taken out. To prove the size and weight of this mass, it should be dried and afterwards burnt on a thin plate of iron, under which is kept a fire always equal for an hour or more, if necessary. It is proper to take the precaution to stir the earth that it may be burned equally; when it quits smoking, then all the vegetable parts are consumed, and there only remains sand mixed with the cinders, and some particles of earth. In this state, if the mould is of a good quality, its size will be diminished $\frac{1}{2}$, and its weight $\frac{1}{3}$, subtracting from the weight of the water, it contained before it was dried at the fire. If the diminution of the mass is greater, the heath-mould will be the better, since it contains a greater number of particles fit for vegetable nutriment.

The second proof is shorter, you have only to take a quantity of heath-mould, the weight of which is proved: put it in a vessel capable of containing five or six times as much, fill this vessel with wa-

ter, let it stand some hours, till the fluid penetrates every part. When all the parts have imbibed the water, stir it, and pour off the liquor, put the remainder into new water, and stir it again, when all the vegetable parts will swim, and on pouring out, the water will be carried along with it as well as other light particles, and there will remain at the bottom only sand and other substances not fit for vegetation; this remainder is generally but the third of the size of the mass before it was proved. We have been thus particular in directing the choice of heath-mould of a good quality, because some cultivators have confounded it with peat-earth, or poor sand which had no resemblance but in colour. There has resulted from this mistake, many inconveniences; and want of success in the cultivator has been the consequence.

The least doubtful properties of the heath-mould are—1st. The being easily penetrable to the roots. 2nd, The ease with which it absorbs the humidity of the air to a great depth. 3d, The preserving it a long time. 4th, The imbibing a great quantity of water without a tendency to putrefaction or rotting of the roots. And also, 5th, furnishing a more abundant supply of matter, proper for the encouragement of vegetation, it is necessary that this earth should be in a sufficient quantity and disposed in a proper manner.

The heath-mould put in a small quantity, and without preparation at the foot of a tree, above the earth produces but little effect. The earth surrounding absorbs the moisture, and if it is often watered, the good juice which it contains, is carried away with the water, and by this means it will be quickly impoverished. But if it is employed in a sufficient quantity, and disposed in a proper manner, it produces the

* In the neighbourhood of Paris, the heath-mould is found in the wood of Boulougne near Meudon, and on the banks of Virriere.

most beneficial effects for a long time.

It is also necessary to adopt the most favourable situation; this is that which is shaded from the mid-day sun. If by trees at such a distance that the earth is not penetrated by their roots, it is preferable on many accounts, a wall or pallasades to break the wind will produce the same effect. The difference in the nature of earths is what establishes the use of heath-mould, and also the necessity of employing it in this manner, when the soil is of the nature of clay, and compact, and when impregnated with moisture it easily retains it; it is sufficient to dig the earth the depth necessary for the size of the roots of the trees or shrubs you intend to cultivate, which differs no less than from two to four feet in depth. This pit should be dug in the form of a trough, well rounded, and it will be necessary to beat the sides of this pit to give them the more solidity, and to prevent too great a filtration of water. Afterwards it is to be filled with heath-mould in the following manner:

The heath-mould as it is brought from the fields, is in large or small lumps, which generally contain roots and stalks of heath not yet rotted or decomposed, the quantity of this stuff is often one fourth, which would produce a waste if you were obliged to throw it away, after having separated them from the mould, they are to be mixed with one third of earth taken from the soil, and another third of heath-mould sifted, but not made fine, and then make the first bed, which must take up nearly one third of the under part of the pit; the second bed is composed of a mixture two-thirds of the heath-mould, with one-third of the earth of the soil, and the upper bed is made of the heath-mould, as soft

and fine as possible; the surface of the upper bed ought to be raised from four to six inches above the adjoining ground, and to be surrounded with an edging of boards, brick, or stone, as well for the neatness of the garden as to preserve the moisture favourable to vegetation. When the soil is of a dry nature, full of stones, and too pervious to the water, such as are almost all the gardens about Paris, it is necessary to take another method, which has perfectly succeeded with us.

When the ground is dug the size necessary for the object of cultivation, compose a mortar with clay*, straw cut short, and water, this mortar should be of such a consistence as to stick easily against the sides of the pit when thrown against them; a plaster of this is to put about four inches thick over the whole pit and left to dry, observing to beat it down every day, that the crevices caused by the contraction of the mortar by drying, may be entirely effaced, and the surface smooth without any cracks. The pit must afterwards be filled with light loamy earth and heath-mould mixed in the same order and proportion as before directed.

We formerly made use of another method to prevent the loss of the moisture from the bed of heath-mould, in place of using the mud or mortar before-mentioned, for plastering over the inside of the pit, we used clay alone as a substance very proper for the purpose, but we were not long in finding that this method which appeared so simple at first sight, was the worst that could be employed; during the first eigh-

* The French gardeners name this earth *Terre Franche*, it is what is used for constructing ovens. (This is the same composition that is used for mud walls in Ireland.)

teen months, the shrubs we had planted in the border thrived very well, and many of them flowered, but at the end of this period the roots having penetrated to the clayed sides of the bed, the shrubs began to grow yellow, and the roots not finding a passage in their horizontal direction, descended into an unwholesome soil, occasioned by the putrefaction of the water gathered at the bottom of the pit, the shrubs were covered with cankers, after which they withered and decayed; at the end of five or six months the examination which we made of the roots of the plants, which were either dead or dying, did not permit us to doubt, that the means which we had used to preserve them, was the cause of their being lost.

The expedient we make use of at present has not this inconvenience, it preserves moisture, but it is only that which is favourable to the roots, with which the resistance they meet can only stop the very weakest, the rest easily pierce through, and spread beyond it. A plant of the *Laurus Benzoin*, and another of the *Halesia* of Virginia, which were set seven years ago, we will give as a proof of this fact. When the most frequent watering is not sufficient to preserve the moisture necessary for the growth of certain shrubs, which require a soil both light and rich, such as the different species of *Myrica*, *Salex*, &c., or which should have the extremities of their roots in water, without being entirely plunged into it: you then should use an earthen-ware pipe, of three inches diameter, the length being equal to the length of the border, pierced with a number of holes in all directions; this pipe should be placed almost horizontally over a plaster in the middle of the border, that it may remain always moist; the lower extremity should be shut, the

other bent about six inches upwards, and inserted into the bottom of a vessel, kept continually full of water, placed at the head of the border; the water running with ease through the pipe, distributes itself on all sides by means of the holes with which the pipe is pierced, and preserves in the under part of the ground the moisture necessary for vegetation, this practice supplies moisture better than watering, and we have always known it to have the best effects. The dimensions here given for the borders of heath-mould, are the best for facility of cultivation, and preserving the plants. In the Botanic Garden, their breadth is fixed from three to five feet, and the length, which ought not to be less than six feet, you may make as much longer as you chuse. They seldom, however are made longer than eight or ten fathoms, and placed as much as possible in the direction of East and West, that they may be the more easily shaded from the mid-day sun, by a hedge, or other shelter, natural or artificial. In pleasure-gardens, especially in those called landscape-gardens, the dimensions given are such as suit the size of the place, only what constitutes the pit which is to contain the heath-mould, ought to be proportioned to the nature of the vegetables you intend to cultivate, and to the earth of the soil. Six years ago, in a garden near Meudon, we had several plots intended for the culture of plants in heath-mould, the dimensions of their surface were several fathoms each way, and though we had made the depth but three feet and a half, the four species of *Magnolia* grew with the greatest vigour; the common is already six feet high, and flowered last year. It must be confessed, however, that this great height is an inconvenience, and requires great

care in the management of the plants. Heath-mould should not be treated like common earth; deep digging is not fit for it, frequent weeding to prevent weeds or useless plants from hurting the shrubs, and digging it in Spring and Autumn, is sufficient for a soil which never naturally grows hard, and which the air penetrates with ease. The heath-mould being mostly composed, as was before remarked, of vegetable particles, which will, by decomposition, grow necessarily poorer, it is beneficial to make up what it loses, by covering the whole border with fresh heath-mould, about three inches deep, which will be sufficient to produce this effect. When the plants have acquired strength, and have been two or three years planted, you may each spring mix with the heath-mould, with which you cover the border, one-third of free-earth, made very fine; this mixture gives a body to the general mass and is more assimilated to the vigour which the plants have acquired.

It would be almost as difficult to tell exactly all the exotic plants which agree with a soil of heath-mould, as it would be to name those to which it is unfavourable; it is very certain, that all sorts agree very well with it in the first years of their growth, that they thrive there infinitely better than in any other soil, and that they grow more quickly; but all sorts are not preserved by it equally long. We shall content ourselves with naming the most delicate plants, of which we owed the preservation to this mode of culture. (*A list of them will be found at Page 195.*) The plants mentioned in this list, are not only preserved by the heath-mould, but the most of them encrease without much care, and oftentimes by suckers and sowing

themselves, such as the *Spiraea tomentosa*, and *Salicifolia*, and the *Hypericum Kalmianund*. Experience has proved, that the shrubs which had been planted several years in heath-mould, were less susceptible to the impressions of cold, than those which are placed in the same situation, in any other kind of earth. The vigour of these plants proceeds from their being more firm, and acquiring their strength in less time. A fact observed at the end of the winter of 1776, appears to us to deserve a place here.—Several Orange-trees, from three to six feet high, and forming young fruit, had been shut up in 1775, in a little green-house, where it froze from 4 to 5 degrees* for several nights successively. The Orange-trees were frozen, the leaves dropped off, and the greatest part of the young shoots died; one alone, though in the midst of the rest, not only lost not a leaf, but the complexion of its verdure became of so dark a colour, that it was almost black. A singularity so extraordinary, excited our curiosity, and induced us to look for the cause; as they were all equal in other respects, we examined the nature of the earth in which it was planted, and we were not long of acknowledging, that it was to that cause alone that it owed its preservation and its vigour, this tree having had occasion to be removed into a new case at the end of the preceding summer, had been put with the roots almost bare into a new case, filled by mistake with pure heath-mould, in place of the earth for Orange-trees; the remainder of the summer, and all the autumn, it was placed behind a shade, by which means it had time to form new roots before winter, and its

* That is to about 34° of Fahrenheit's Thermometer.

strength preserved it in such a manner, that without this fortunate circumstance, it would have been supposed to have been the effect of chance. It continued to grow up vigorously enough for some months, but its strength began very soon to decrease, and before the end of the year, it had to get a soil stronger and more suitable to the nature of its roots.

The exotic shrubs which appear to us not to agree with a heath-mould soil, at the end of some years are in general those which have large succulent roots, and which have not many fibres, the heath-mould does not make resistance enough to them, nor give their roots the degree of pressure necessary for their vegetation. Almost all trees, after the two or three first years, vegetate as ill as the shrubs do well, if their roots do not become strong enough to make their way out of the border, and extend to a soil more suitable to their strong vigorous constitution.

The shrubs, on the contrary, which appear to require more indispensibly the heath-mould, are those which have roots of a dry brittle nature, and which have very few strong, but a great number of very small or fine ones, almost without suppleness, the skin with which they are covered being extremely thin, they become dried almost as soon as exposed to the air. As almost all these vegetables do not grow naturally, but in places damp and shady, and upon beds of earth formed of decayed vegetables, (such as the different species of *Vaccinium*, the *Arbutus Alpina*, the *Azalea procumbens*, and the *Empetrum*, &c.) A person cannot hope to cultivate such shrubs, without furnishing them with a soil analogous to that which is prepared for them by nature. The use of heath-mould is not confined to the

culture of plants in the open ground, but is used also with the greatest success for seeds in boxes and in pots; the purer it is, it is the better for this use, but it must be placed to the east to produce all the effect of which it is capable.

In general, whether the seeds be in boxes or pots, it is proper to put a light earth at least two inches deep in the bottom. This precaution is necessary to preserve the moisture in the heath-mould, and to make the roots of the young plants throw out numerous fibres, on which depends the certainty of their growth, when they are transplanted. Without the favourable resistance with which the roots meet from the soil between the bottom of the box or pot, and the upper bed of heath-mould, the young plants are induced directly to descend to the bottom, and the fibres they put forth are weak. There are many plants to which the want of this precaution is very hurtful, so much so, that when their roots have got to the bottom of the vessel, vegetation ceases, the plants grow yellow, and sometimes die. The heath-mould used for seeds in vessels, requires to be exposed in a proper manner, as I said before, a northern situation is the most favourable and proper to preserve the moisture necessary for vegetation, the rising is preferable to the setting sun, and the latter is much better than the mid-day, with which very few seeds can agree. If possible, the vessels should be sunk in the earth, either in a border, if they contain seeds of hardy plants, or in the earth of a hot-bed, if they contain seeds of vegetables, which require a degree of heat more considerable than our climate. The culture by heath-mould in vessels, is confined to weeding and watering; the latter should be administered

with a watering-pot, having a rose with very fine holes, and poured with precaution, that it may not uncover the seeds which are beginning to grow, nor unroot the young plants which are more advanced. The more these waterings resemble a fine and gentle rain, the better they fulfil their object; it should be done in the evenings and mornings, in preference to any other time of day.

But in order to know plants which cannot do without heath-mould, as without doubt most bulbous rooted plants, particularly those which come from the Cape of Good-Hope, they may be seen in the garden of M. L. Monier. This is the most extensive collection of the kind, and certainly the best guide. In this the heath-mould is the only earth employed. In fine, the heath-mould is an agent when set to work with intelligence, that offers a means of assuring the cultivator of success. By using it, he is enabled to raise a great number of trees and shrubs, which were formerly found difficult to accomplish. It also adds to the means by which we formerly raised exotic plants, and prevents the decay of a great many. But at the same time, it must have been observed in the course of this memoir, that the manner of employing it must have a considerable influence on the success.

A list of the Plants which are cultivated with success in the open air, in the borders of Heath-mould.

Andromeda, all the species.
 Anthillis montana.
 Arbutus Uva ursi.
 alpina.
 Azalea, all the species.
 Betula pumila.
 Calicanthus Floridus.
 Ceanothus Americanus,
 Clematus crispa.
viorna.
 Clethra alnifolia.
 tomentosa.

Cornis flōrida.
 Cuppressus thyoides.
 Cytisus nigricans.
 Daphne alpina.
 cneorum.
 gnidiuni.
 dioica.
 Dirca palustris.
 Dryas octopetala,
 Empetrum nigrum.
 Erica tetralix.
 scoparia.
 ciliaris.
 multiflora.
 mediterranean.
 Euonymus Americanus.
 Fagus pumila.
 Fothergilla speciosa.
 Gaultheria procumbens.
 Hypericum Kalmianum.
 Itea virginica.
 Kalmia, all the species.
 Ledum, all the species.
 Liquid amber asplenifolia.
 Nitraria Schrœberi.
 Osyris alba.
 Pinus palustris.
 Prinus glabra.
 verticillatus.
 Rhododendron, all the species.
 Rhodora canadense.
 Salix myrsinites.
 arbuscula.
 retusa.
 reticulata.
 lanata.
 rosmarinifolia.
 Spartium patens.
 radiatum.
 Spirœa tomentosa.
 sorbifolia.
 Stewartia malacodendron.
 Vaccinium, all the species.
 Viburnum acenfolium.
 Yucca filamentosa.

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LONGINUS, in his treatise on the sublime (7th section of Pearce's edition) enjoins on his friend, to whom the treatise is inscribed, the necessity of a close examination into the pretensions of every thing,